

WHAT IS CLAIMED IS:

1. An isolated nucleic acid molecule comprising a nucleotide sequence that encodes a short-root protein.

2. The isolated nucleic acid molecule of claim 1, wherein said short-root protein comprises the amino acid sequence of SEQ ID NO:2

3. An isolated nucleic acid molecule comprising a short-root nucleotide sequence.

4. The isolated nucleic acid molecule of claim 3, wherein said short-root nucleotide sequence comprises the nucleotide sequence of *SHR*, *shr-1*, *shr-2*, *shr-3* or *shr-4*.

5. An isolated nucleic acid molecule which hybridizes under stringent conditions to the nucleic acid molecule according to any one of claims 1 and 3, or the complement thereof.

6. A recombinant vector comprising the nucleic acid molecule of 5.

7. An expression vector comprising the nucleic acid molecule of claim 5 operatively associated with a regulatory nucleic acid controlling the expression of the nucleic acid molecule in a host cell.

8. A genetically-engineered cell comprising the nucleic acid molecule of claim 5.

9. A genetically-engineered host cell comprising the nucleic acid molecule of claim 5 operatively associated with a regulatory nucleic acid controlling the expression of the nucleic acid molecule in a host cell.

10. A method for producing a SHORT-ROOT polypeptide comprising expressing a nucleic acid molecule according to claim 5 in a cell.

11. An isolated SHORT-ROOT polypeptide.

NO:2. 12. The polypeptide of Claim 10 comprising the amino acid sequence of SEQ ID

5 13. An isolated SHORT-ROOT polypeptide encoded by the nucleic acid molecule of claim 5.

14. An antibody that immunospecifically binds the polypeptide of claim 12.

10 15. An anti-idiotypic antibody that mimics an epitope of a SHORT-ROOT protein.

15 16. A plant genetically-engineered to overexpress or underexpress a SHORT-ROOT protein or polypeptide, so that cell division is modified, and root and/or stem development is altered.

17. A plant genetically-engineered to overexpress a SHORT-ROOT protein or polypeptide, so that cell division is increased in roots, resulting in thicker root development.

20 18. A transgenic plant comprising a transgene having the nucleic acid molecule of claim 5.

19. A transgenic plant comprising a transgene having the nucleic acid molecule of claim 5 operatively associated with a regulatory nucleic acid controlling the expression of the nucleic acid molecule in a transgenic plant cell.

25 20. The transgenic plant of Claim 17, in which the transgene encodes an antisense nucleotide sequence that suppresses expression of endogenous *SHORT-ROOT* gene product, so that cell division is decreased in roots, resulting in thinner root development.

30 21. A genetically-engineered plant in which the endogenous *SHORT-ROOT* gene is disrupted or inactivated so that cell division is decreased in roots, resulting in thinner root development.

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22. A transgenic plant containing a transgene encoding a gene of interest operatively associated with a *SHORT-ROOT* promoter, so that the gene of interest is expressed in a tissue-specific manner in roots or embryos.

5 23. The transgenic plant of Claim 21, in which the gene of interest encodes a gene product that confers herbicide, salt, pathogen, or insect resistance.

24. A transgenic plant containing a transgene encoding a gene of interest operatively associated with a *SHORT-ROOT* promoter, so that the gene of interest is
10 expressed in shoots.

25. The transgenic plant of Claim 23, in which the gene of interest encodes a gene product that increases starch, lignin or cellulose biosynthesis.

15 26. A plant genetically-engineered to overexpress or underexpress the *SHORT-ROOT* protein so that gravitropism of the stem or hypocotyl is altered.

27. The plant of Claim 25, which is less susceptible to lodging than a wild-type plant.

20 28. A method for identifying a compound which modulates expression of a *SHORT-ROOT* comprising:

- (a) contacting a test compound to a cell that expresses a *SHORT-ROOT*;
(b) measuring a level of the *SHORT-ROOT* expression in the cell; and
25 (c) comparing the level of the *SHORT-ROOT* expression in the cell in the presence of the test compound to a level of the *SHORT-ROOT* expression in the cell in the absence of the test compound;

wherein, if the level of the *SHORT-ROOT* expression in the cell in the presence of the test compound differs from the level of expression of the *SHORT-ROOT* in the cell in the
30 absence of the test compound, a compound that modulates expression of the *SHORT-ROOT* is identified.

29. A method for identifying a test compound capable of modulating root or shoot-specific gene expression comprising:

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(a) measuring the level of expression of a reporter gene under the control of a SHR regulatory region, or a transcriptionally active fragment thereof, in the presence and absence of said test compound,

such that if the level obtained in the presence of the test compound differs from that

5 obtained in its absence, then a compound which modulates root or shoot-specific gene expression is identified.

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